Operating Manual

Mass comparators – WAX series

- WAX 210/KO
- WAX 510/KO
- WAX 2100/KO
- WAX 5100/KO

MANUFACTURER
OF ELECTORNIC WEIGHING INSTRUMENTS

RADWAG 26 – 600 Radom, Bracka 28 Street, POLAND
phone +48 48 38 48 800, phone/fax. +48 48 385 00 10
Sales Department +48 48 366 80 06
www.radwag.com

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Contents

1. UNWRAPING THE COMPARATOR 4
2. START THE COMPARATOR UP 10
3. APPROPRATION 11
4. DESCRIPTION OF THE COMPARATOR - display 12
5. USER MENU 13
6. COMPARISON 21
6.1. Log-in function 22
6.2. Method of measurements 25
7. CALIBRATE / ADJUST 27
7.1. External calibration 28
7.2. Calibration report printout 28
8. SETTING PRINTOUTS FOR GLP PROCEDURES 30
9. SETTING TIME AND DATE 30
10. SETTING THE PARAMETERS 34
10.1 Setting filter 34
10.2. Mediane filter setting 34
10.3 Set the display refreshing time 35
10.4 Set autozero working 35
10.5. Last digit 35
10.6. Negative 35
11. FUNCTIONS IN USING RS 232 PORT 36
12. PRINTOUTS 37
13. ACCESS TO MASS UNITS 37
14. SETTING ACCESSIBILITY OF THE WORK MODES 38
15. OTHER PARAMETERS 40
16. USING WORK MODES 42
16.1. Standard deviation for comparator 42
16.2. Statistics 48
17. KINDS OF PRINTOUTS 50
17.1. Standard printout 50
17.2. Non-standard printout 51
18. COOPERATION WITH PRINTER OR COMPUTER 57
19. LIST OF COMMUNICATIONS COMPUTER - COMPARATOR 58
20. TECHNICAL PARAMETERS 60
21. COMMANDS ABOUT ERRORS 64

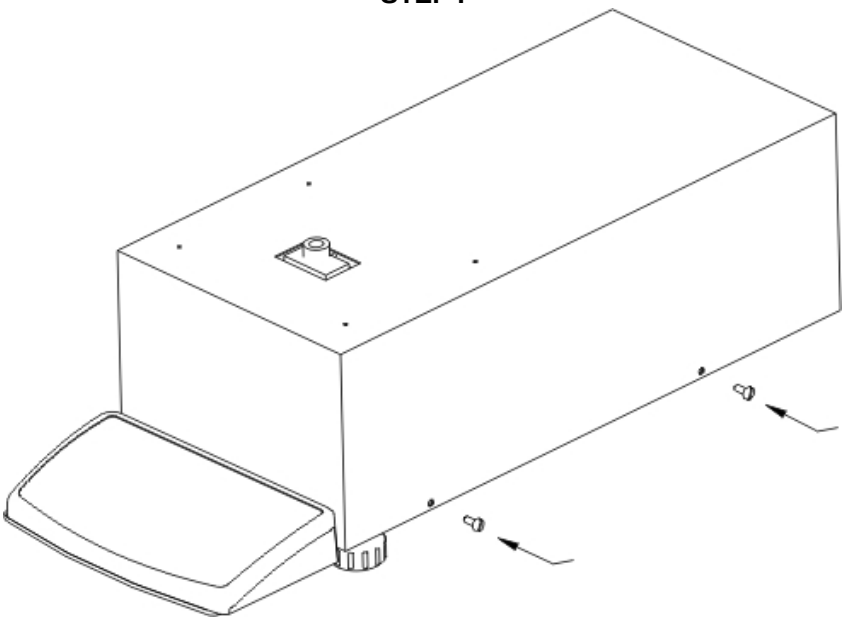
1. UNWRAPING THE COMPARATOR

1.1. The comparator WAX 2100/KO

Take the comparator out of the box. Remove the protection foam. Take all components out of the box.

THE COMPONENTS INSTALATION FOR THE COMPARATOR

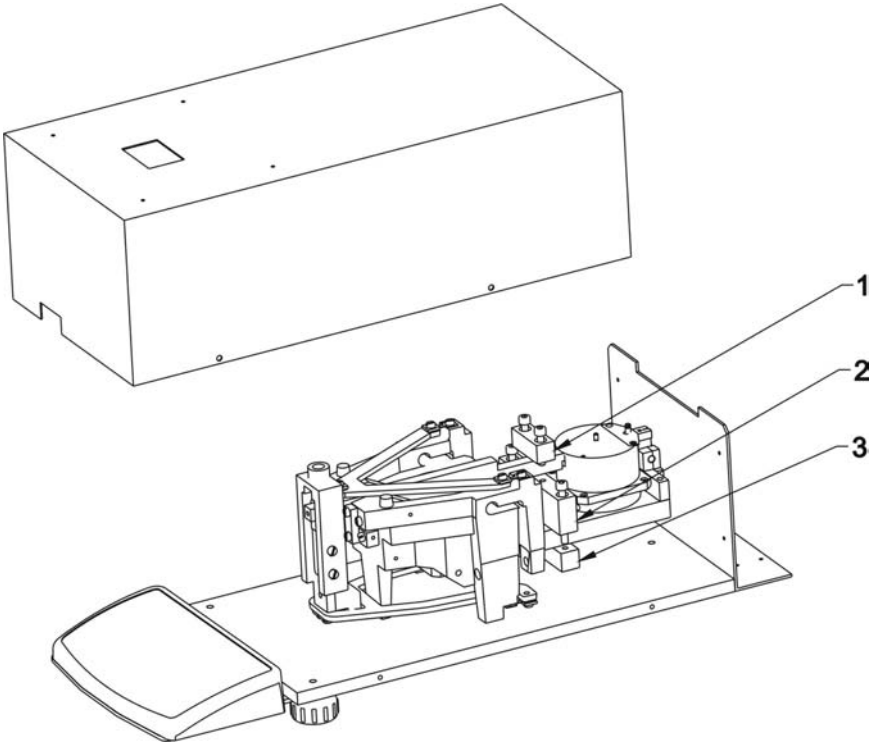
STEP I



Unscrew four bolts on the sides of casing, then carefully remove casing.

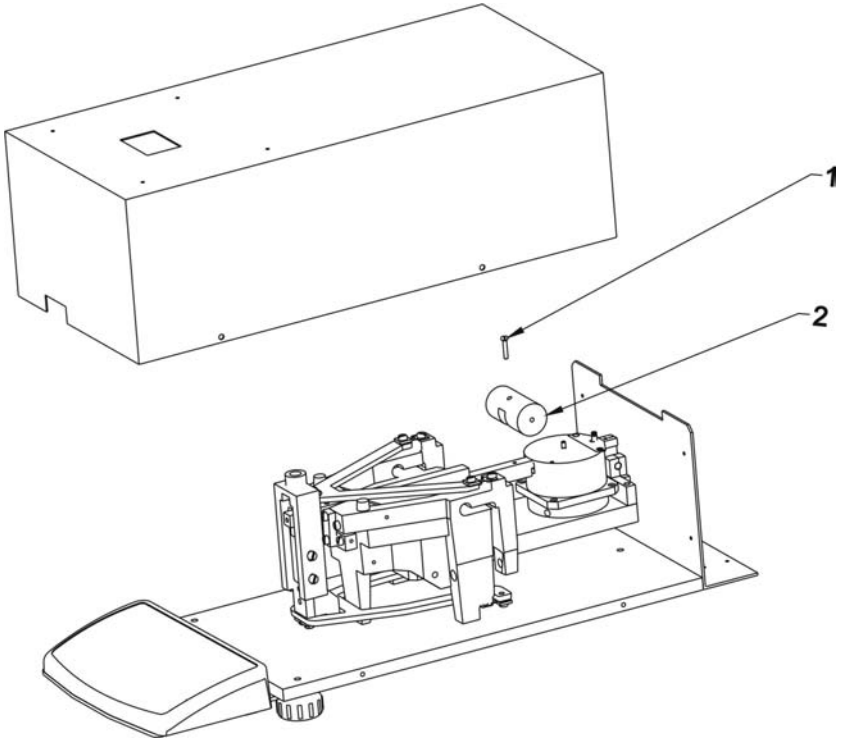
STEP II

REMOVE CARRYING PROTECTION.



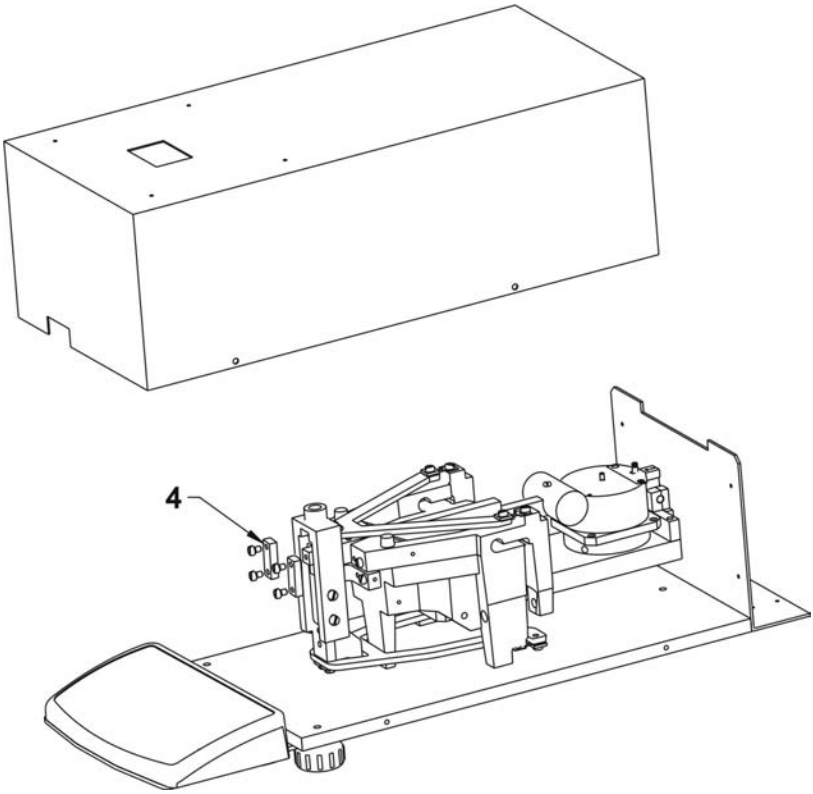
Unscrew and remove carefully holding down block 1. Next unscrew and remove carefullybase block 2, 3. Disassembled protections keep together with packing.

STEP III



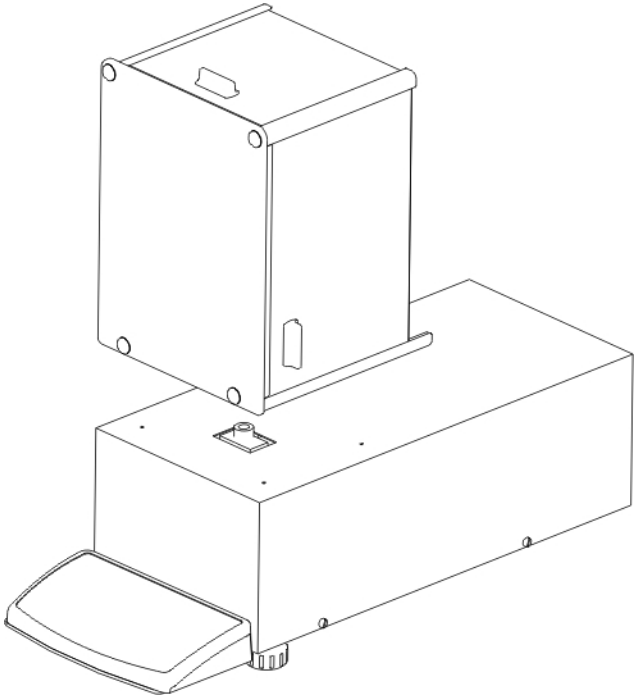
Tighten up balance weight to weighbeam.

STEP IV



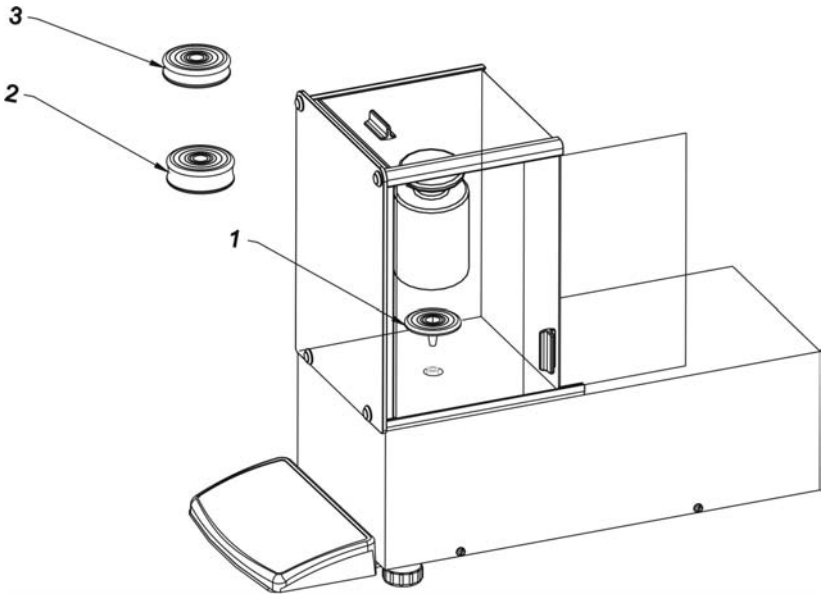
Unscrew and remove carefullybase block 4 (2 pieces) and assembly casing of comparator.

STEP V



Instalation glass draft shield with 3 sliding doors

STEP VI - STARTING



Assembly pan 1and load 2kg weight, according to draving above.

After assembling all components, slide the glass doors shut and plug in the balance. The jack plug is in the rear of the balance.

2. START THE COMPARATOR UP

2.1. Conditions of proper usage

Set up the mass comparator in a conditioned room kept at a constant temperature (max. allowable fluctuation: $\Delta T < \pm 0.5°C/h$).

When choosing a location to set up mass comparator, observe the folowing so that you will be able to work with added and accurace:

- Set the comparator on stable table, far from vibrations
- The comparator should be replaced far from draughts and air breeze.
- The comparator should be in stable temperature and humidity room
- The comparator should be replaced far from sources of
- Temperature in the room +18°C ÷ +30°C
- If the static electricity has influence on the comparator indications it base should be earthed. Earthing screw is in the rear part of the comparator base.
- The comparator should be replaced in leveled position

During a weighing operation, avoid moving around in the room where the mass comparator in set up.

2.2. Set level up

The comparator should be leveled. The correct leveling is shown on the level indication installed at rear of the comparator.

level - OK

level incorrect

2.3 Warming up

Before measurements user should wait untill the comparator reaches temperature stabilization. It is warming up time.

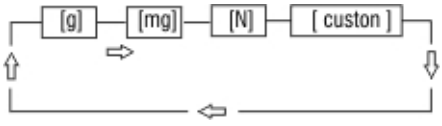
For comparators WAX, warming-up time is about 4 hour. This periods refers to the comparators which ware in surrounding temperature (work) before start weighing.

If the WAX comparators are kept in, lower temperature before weighing the warming-up time is about 12 hours. During warm-up stabilization, the indications can change.

3. APPROPRATION

The comparators are used to do precise measurements in laboratories. It is possible to do the zero function in all measure range.

The comparator weights in following units:



Measure units

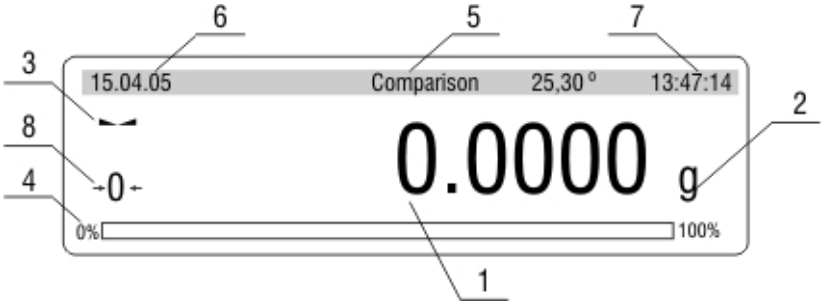
Apart from mass comparrision in various measure units the comparator also:

- standard deviation
- creates statistics

Measure units and particular functions can be inaccessible for user. It is possible to adapt the comparator to individual needs and access functions and units which are necessary at this moment.

It is possible to define accessible or noo-accessible in user menu and it is described in further part of the manual.

4. DESCRIPTION OF THE COMPARATOR - display



Display comparator

1. load mass and quantity of pieces
2. measure unit
3. the result is stable
4. line of max range of the comparator
5. work mode
6. date
7. time
8. precise ZERO

4.2. Keyboard

Each key is dual-function key. Particular function can be done through. User also can move in the comparator menu.

Switches the display off.

Function key.

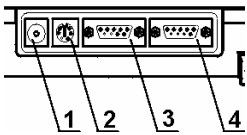
Selects the work mode

Changes measure units

Sends information to external instrument (PRINT) or confirms parameter value or function (ENTER).

Sets indication to zero

4.3 Connections



1. power adapter socket
2. PS keyboard connector
3. RS 232 port
4. additional display socket

Sockets of the comparator

5. USER MENU

There are 9 groups in user menu. Each group is named by P letter. Name and contents of each group is presented below.

P1 Calibration

01	External calibr	* * * * * * * *	Function
02	Kalibr	3	both
03	Calibr time	3	3 hours
04	Report printout	1	on

P2 GLP

01	User	Nowak Jan	
02	Project	AR – 65/04	
03	Time printout	0	off
04	Date printout	0	off
05	User printout	0	off
06	Project printout	0	off
07	Printout Id	0	off
08	Calibration printout	0	off

P3 Date/Time

01	Form date	0	D/M/R
02	Form time	0	24 hours
03	Time	* * * * * * * *	Function
04	Date	* * * * * * * *	Function
05	Display time	1	on
06	Display date	1	on

P4 Readout

01	Filter	3	normal
02	Med. filter	3	normal
03	Disp. refresh	1	0.1 s
04	Autozero	1	on
05	Last digit	1	always
06	Negative	1	disabled

P5 RS - 232

01	Transm. speed	1	4800
02	Parity	0	none
03	Data bits	2	8 bits
04	Stop bits	1	1 bit
05	Transm data	0	none
06	Aut. printout	0	none
07	Interval	1	* 0.1 s
08	Min. mass	4	10 d
09	Print stab	1	enabled

P6 Printout

01	Numer Print	0	standard
02	Print 1 start	1	
03	Print 1 stop	1	
04	Print 2 start	1	
05	Print 2 stop	1	
...	. . . . .		
10	Pr. Edit	* * * * * * * *	function
11	String 1		
11	String 2		
...	. . . . .		
89	String 80		

P7 units

01	Grams	1	enabled
02	Miligrams	1	enabled
03	Newtons	0	disabled
04	user unit	0	disabled
05	factor unit	1	

P8 Work modes

01	Std. Dev.	1	enabled
02	Statistics	1	enabled
03	Power on mode	1	Std. Dev.

P9 Globals

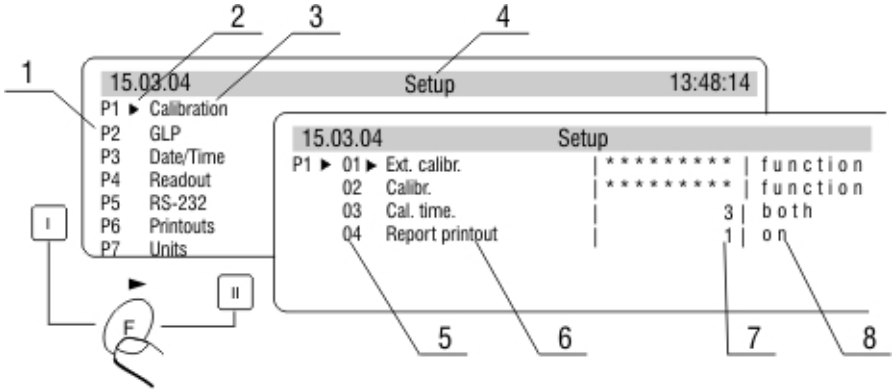
01	Ustawieno ID	********	function
02	Print Aut. ID	0	off
03	Signal	1	enabled
04	Language	1	english
05	Backlight	1	on
06	Contrast	********	function
07	Screen server	0	enabled
08	Temperature	********	function
09	Comparator numbe	114493	
10	Program number	MBCxxx	
11	Printout par.	********	function
12	Parameter reception	********	function
13	Password protection	********	function

Parameters in user menu are:

- functional – for particular activity eg. the comparator calibration
- selectable – selects one of few values from the comparator memory
- noted – changes sets in the comparator memory eg. Date, time, user number, texts

Menu – graphic version

Press the **F** key to display main menu of the comparator (display I). Select the submenu whose content is displayed after pressing the **F** key (display II).



Menu

1 – main menu number
2 – indication of the function selection
3 – function name
4 – currently used function
5 – submenu number
6 – submenu name
7 – attribute of the menu
8 – value of the attribute

5.1. Move in user menu

User moves in the menu by

- the comparator keyboard
- PS keyboard,
- Communicates from computer to the comparator

5.1.1. The comparator keyboard

enter main menu

move down in the menu

move up in the menu

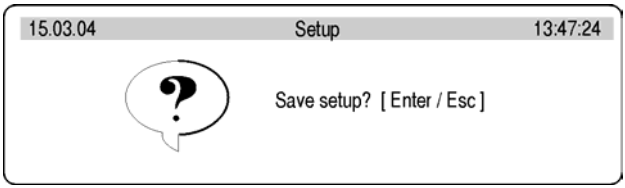
selects submenu which is activated. Submenu contents is presented on the display

move one level up to main menu

Resignation parameter changing

5.1.2. Return to weighing function

Introduced changes are recorded after return to weighing mode and confirm changes. Press the ESC key many times. If following question appears on the display press: ENTER – confirm or ESC – cancel



Return to weighing

5.1.3. PS computer keyboard

Each key on the comparator keyboard has its equvivalent on the PS keyboard:

- for functions

	Description	keyboard
F1	Switch on/off the comparator display	
F2	Move to the comparator menu	
F3	Selects work mode	
F4	Selects measure unit	
F5	PRINT	
F6	TARE	

- for direction keys

↑	Move up	
←	Move to level up	
→	Sets selected parameter	
↓	Move down	

- for ENTER / PRINT keys and ESC

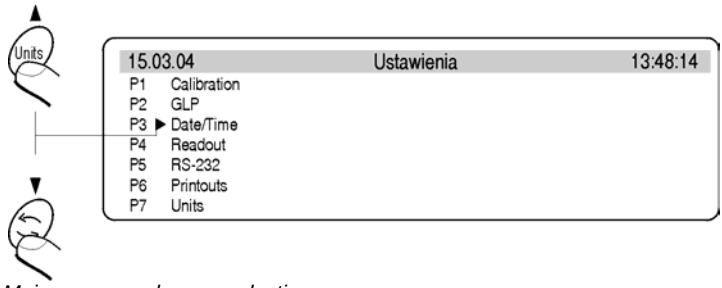
Enter	Confirm changes	
Esc	Cancel and leave function without changes	Esc 0/T

5.1.4. By means of virtual keyboard through RS 232

Most of the functions are done by the comparator desk or PS keyboard. They are aslo done by sending orders computer – comparator.
This commands enables to move in the comparator manu and control the comparator work. The list of the commands is at the end of the manual.

5.2 User menu

The menu is presenting in p. 5. Press the F key in weighing level. Main menu is presenting on the display. Select the submenu, which is modificated.

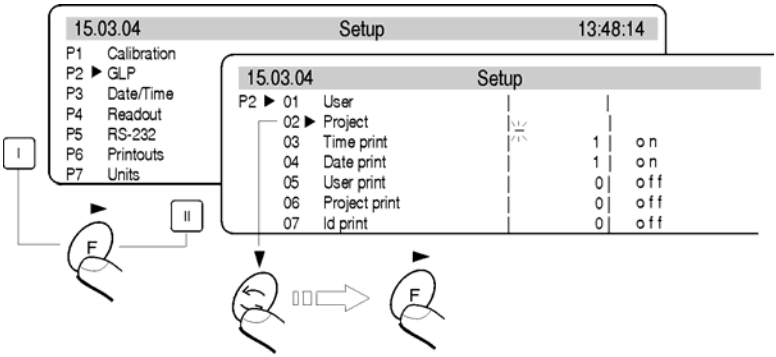


Main menu – submenu selection

If the menu will be modificated, press the **F** key. Selected menu appears on the display. Select what will be changed in this submenu (activate). Select through keys presented on the Draw above. Press the F key.

Reaction of the comparator:

- Activity of the comparator (eg. the comparator calibration) is done for submenu described as Function
- Attribute activation for submenu which is indicated (digit flashing means the value can be changed and some signs can be written)



Tthe comparator submenu

6. COMPARISON

Following conditions must be fulfilled to get reliable results:

- Stable temperature
- Stable ground
- Proper parameters for external conditions

1 Before measurements or for essential changes of the external conditions (if the temperature changes more than 0,5°C/h) calibrate the comparator in accordance with p. 7.

2 Before measurements load the pan and check if the comparator show „precise zero" – displayed →0← in down left corner of the display (only if the parameter P4 06 Autozero has the value 1: yes) and check if the measurement is stable – ◣◢ is displayed in right up corner of the display. If the comparator does not show zero press the key

3 If the conditions are unfavourable (no stable result) lines appear on the display. After settled time the comparator returns to weighing mode without set up to zero. In this case wait untill the conditions stabilize and press **Esc** again

4 By the **Units** key select measure unit. Put the load on the pan and after stabilization read out the result. If measure unit user wants to use is not displayed during pressing the **Units** key check if it has access attribute.

5 The indication can be set to zero many times. Sum of loads noted in the comparator memory cannot be higher than max capacity.

6 Betwenn following measurements do not unpluged the comparator. The comparator should be switched off by the **ON/OFF** key. After pressing the key again the comparator is ready to work without warm stabilization.

6.1. Log-in function

The operator has own access code to internal menu. The password system is defined by administrator. Password can contain max 6 digits.

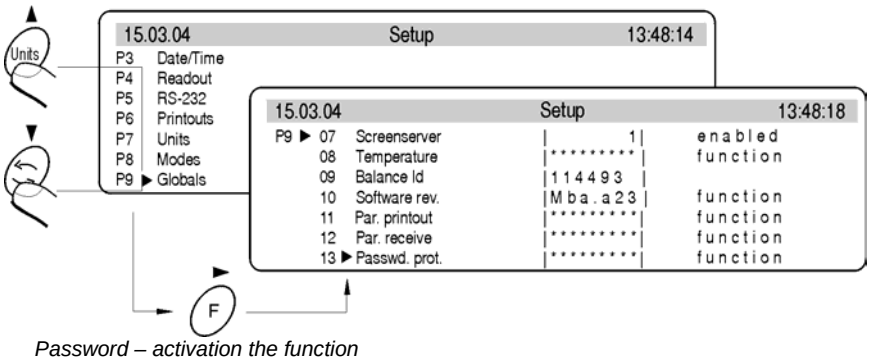
The comparator program enables to declare:

- One administrator who is authorised to use all sets and programme functions, change the passwords – own and user
- One user who is authorised to sets and the comparator functions determined by administrator

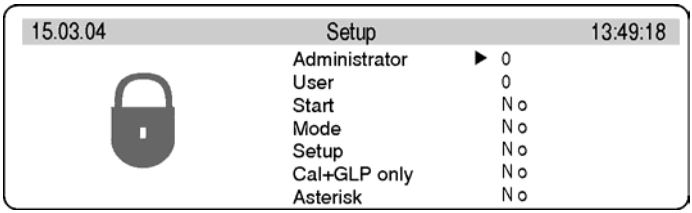
Setting password and access authorization

- *After set the password and access parameters (parameter P9 13 Password protection) write the password for administrator*
- *If the admistrator password is different from "0" the program wants administrator password during enter for the parameter P9 13 Password protection.*
- *Every enter this parameter the software demands administrator password, after writting correct password it is possible to set the parameter P9 13 Password protection*
- *Dependly on setting the password is shown as digits or stars (start value each digit = 0)*

According to p. 5.1.1 of the manual enter the menu **P9 Inne**



Password – activation the function



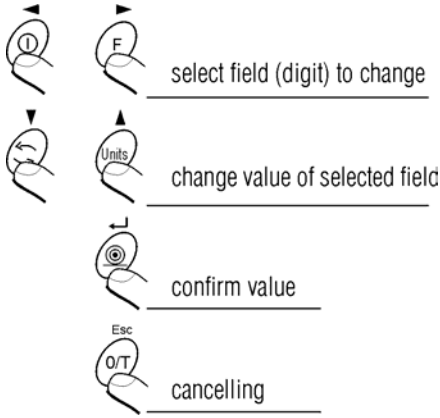
Menu password protection

- **Administrator**
  line to write administrator who has access to all set up
- **User**
  line to write user password. User who has access to setting with NO attribute (are not protected by password)
- **Start up**
  If it is settled on YES during start the comparator up user must write access password (administrator or user)
- **Functions**
  If it is settled on NO (not protected by password) user can use implemented functions in the comparator.
- **Set up**
  If it is set up on NO (not protected by password) user can change setting in the comparator
- **Only Kal+GLP**
  If it is set up on YES user can perform the calibration and calibration report
- **Stars**
  If it is settled on YES during start the comparator up password is hidden under starts

Administrator password

Write the password for administrator (max 6 digits) and user. Each admistrator has access to all functions in the comparator. User has access to comparator possibilities in accordance with above description. Please, remember the password. If you set YES for „Start up" function the password must be writen after switch the comparator on.
If the password is not correct using the comparator is not possible.

To write the password in use keys described on the drawing 2. or PS/2 keyboard (it can be connected to the comparator port).
Set up the attributes for other options dependly on authorizations for user.

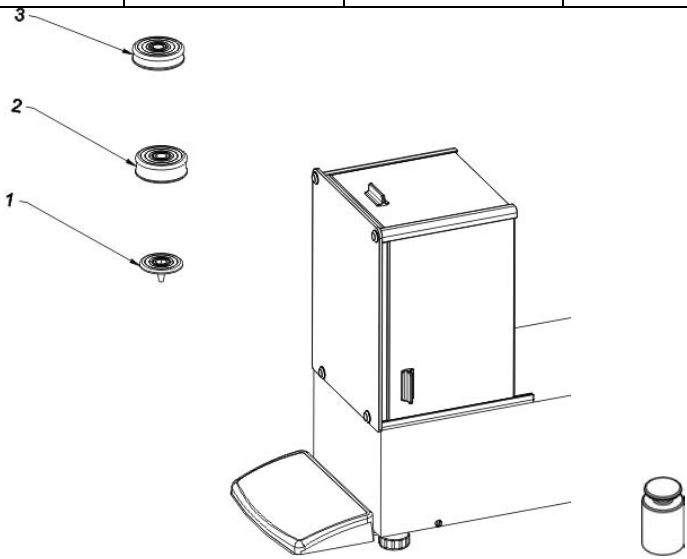


The keys – introducing the values in the menu

6.2. Method of measurements

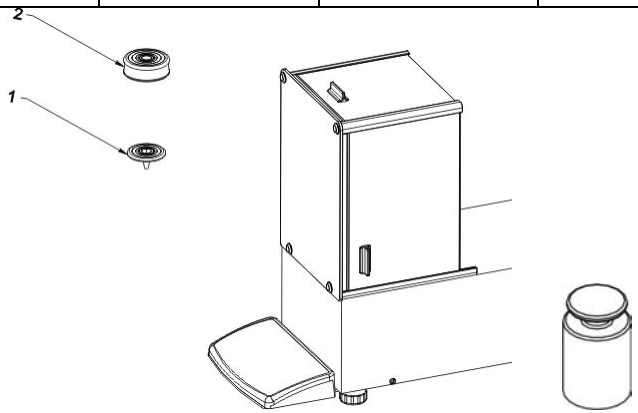
1. Assembly appropriate set of pans for calibration weight, which will be weighed.

WAX 210/KO	WAX 510/KO	WAX 2100/KO	WAX 5100/KO
50g	100g	500g	1kg



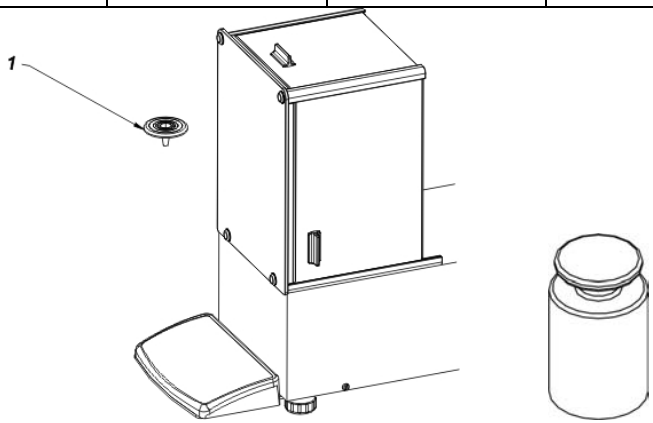
Two additional pan

100g	200g	1kg	2kg



One additional pan

200g	500g	2kg	5kg



Only main pan

2. Place on the pan calibration mass of appropriate value (wait until indication on display will be close to zero).
3. Calibrate/Adjust the comparator according to descriptions on the display.
4. Begin procedure of calibration according to internal calibration manual.

7. CALIBRATE / ADJUST

To ensure high precision of weighing corrective factor in relation to standard mass must be noted in the comparator memory periodicaly – it is the comparator calibration.

Calibration should be performed when:

- The weighing is started,
- Long breaks are between following measure series
- Temperature inside the comparator changes more than: 0,3°C for WAX

Kind of calibration:

- Calibration made with external weight
  * with declared mass which cannot be modificated

Perform the calibration when there is no load on the pan!

01 External calibration

calibration performed by external mass, its value is recorded in factory menu, function inadmissible in verified comparators

02 Calibration time

Determination of time calibration starts up

If you set signalization of necessity of performing adjusting by temperature changes or time changes, after detection by comparator software conditions for which adjusting should be performed on the display icons will appear:

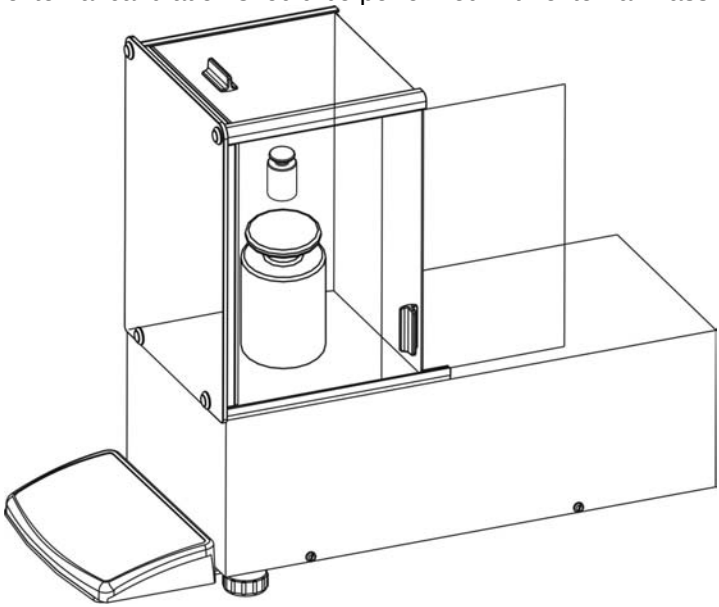
After performing the procedure , the icon should disappear from the display .

Return to weighing

The changes are recorded when the comparator returns to weighing mode with the recording the changes. Press the ESC many times. Following question appears on the display. Select one of the options : ENTER – record / ESC – cancell *(see Return to weighing p. 5.1.2. Return to weighing)*

7.1. External calibration

The external calibration should be performed with external mass class E2:



List of weights for separate comparators is included in technical specification in the final part of the manual.

1. Move to submenu P1 – Calibration.
2. Select the function 01 external calibration
3. Press the F key (main weight on the pan).
4. Order to yese the load off the pan appears on the display (no load on the pan). After yesing load off the pan press the ENTER key.
5. The comparator determines mass of empty pan
6. Put load and press the ENTER
7. After the calibration the comparator returns to submenu P1 - Calibration
8. Return to weighing – as in the point 5.1.2.

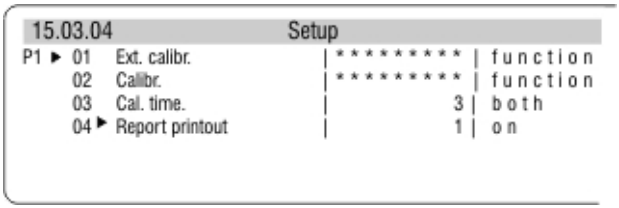
7.2. Calibration report printout

After calibration user can reveice the calibration report. The report can be printed on connected printer and sent to computer or recorded in file.

P1 04 Report printout : 1:yes – report is printed
P1 04 Report printout: 0:no – report is not printed

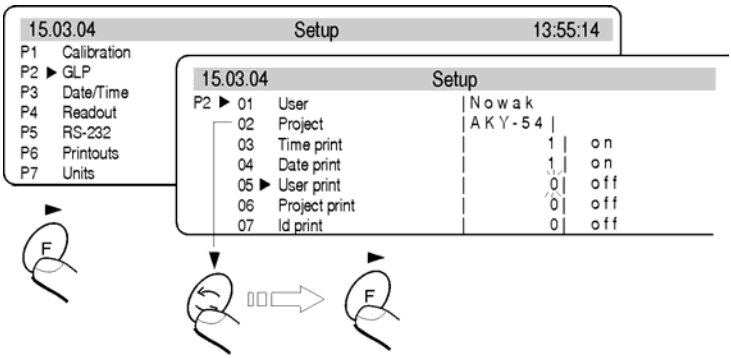
If the parameter has the value 1 the report is genrated and sent

automaticaly.



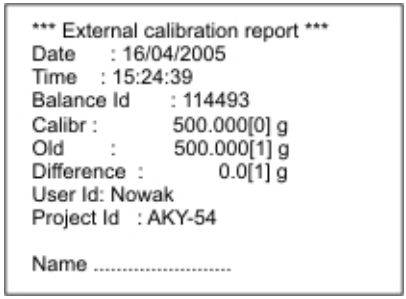
Submenu calibration

A content of report depends on setting in submenu GLP. All options with YES attribute are printed.



Submenu GLP - setting

Apart from information settled in menu group the report contains: calibration mass remembered by comparator after last calibration (description Old:), calibration mass determined during actual calibration (description: Calibration) and deviation of the calibration (description Deviation:) – difference between these two masses.



Example of comparator calibration report

8. SETTING PRINTOUTS FOR GLP PROCEDURES

P2 GLP is group of the parameters which declares factors on the calibration printout. For fields:

- user (max 8 alphanumerical signs)
- design (max 8 alphanumerical signs)

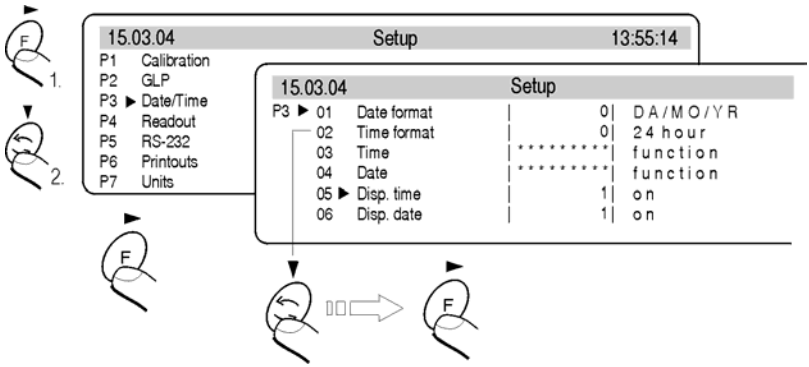
introduce names by the comparator keyboard or the PS/2 keyboard. For the rest select:

- 1 no (do not print during report)
- 0 yes (print during report)

Main view of the GLP submenu is presented on drawing 19, page 24. If you use the PS/2 keyboard see what dipendences are between the comparator keyboard and PS/2 keyboard (p. 5.1.2)

9. SETTING TIME AND DATE

The comparator has real time clock whose parameters can be modificated. Enter the menu group P3 Date/Time as it is show below:



Submenu Date / Time

01 Date form

There are two possibilities:

- 1 format date Month/Day/Year
- 0 format date Day/Month/Year

After selection proper value confirm by the ENTER key.

02 Time form

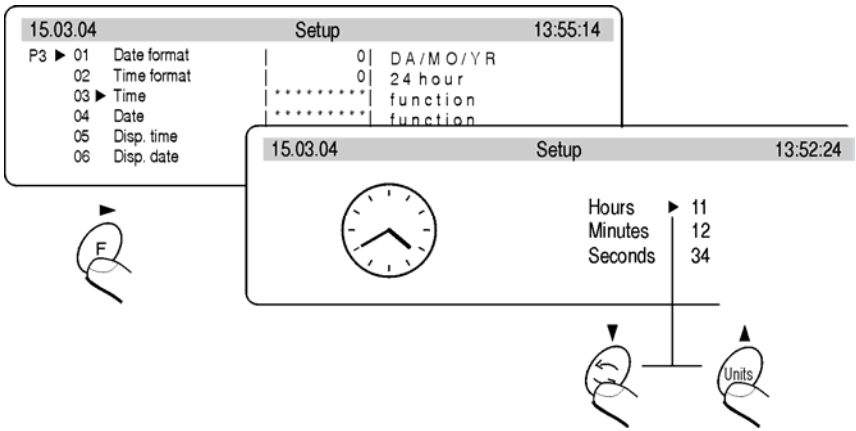
There are two possibilities:

- 1 time form 12 h
- 0 time form 24 h

After selection press the ENTER to confirm.
12 h form is distinguished by the letters PM or AM on the printouts.

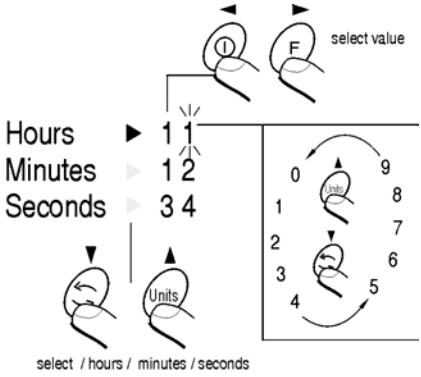
03 Time

Enter setting the parameter 03 Time by the F key in accordance with below scheme.



Submenu / Time – setting time

Replace the marker next to the value which will be changed (Hour, Minute, Second). Confirm with the **F** key. Change the numerical values with Mode and Units keys.



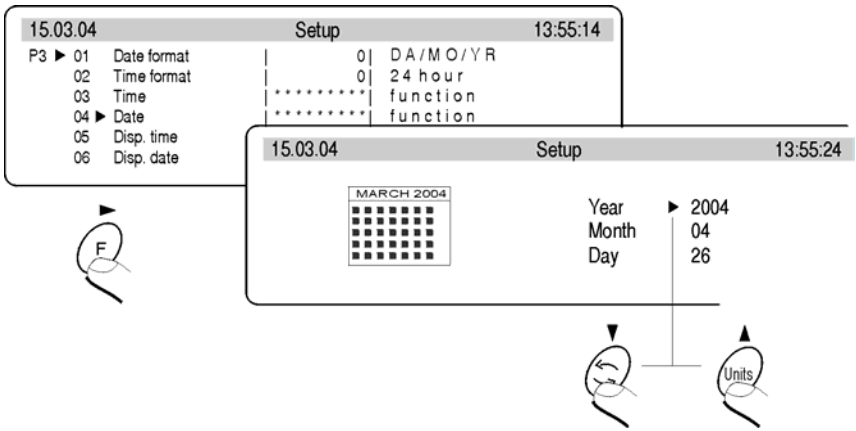
Draw 15. Submenu Date / Time – setting time – steering keys

Confirm settled value (last change digit stops flashing)

Repeat above activities for following values. After setting new values for time press the ENTER key. The comparator returns to submenu P3 Date/Time and displayed time changes.
After setting time return to weighing mode in accordance to p. 5.1.1 of the manual.

04 Date

Set the parameter 04 Date with the F key. In accordance with previous description (03 Time) set actual date. After setting date return to weighing mode as it is presented in p. 5.1.2 of the manual.



Submenu Date / Time – setting date

05 Display time

for the value 1 – YES on top graph time is displayed, for the value 0 – NO, time is not displayed.

06 Display date

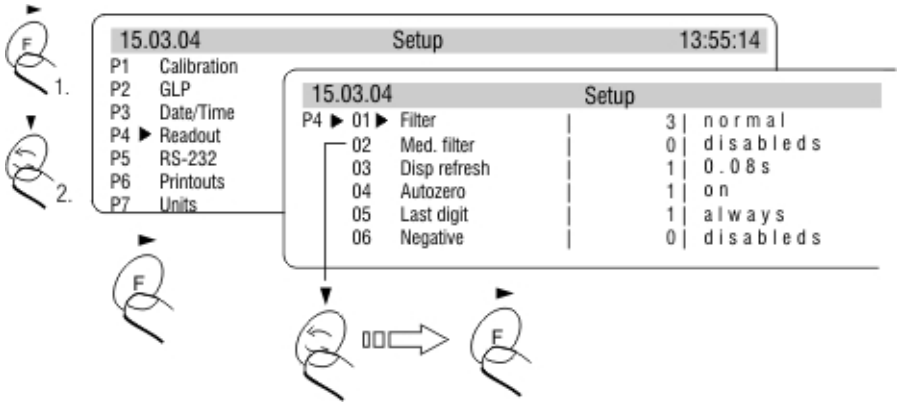
For the value 1 – YES date is displayed on top graph, for the value 0 – NO, date is not displayed.

Return to weighing

(see - 5.1.2. – Return to weighing)

10. SETTING THE PARAMETERS

User can adjust the comparator to existing conditions (filter) and own needs (autozero, displaying last digit) by means of parameters in group <P4 Readout>.



Submenu Readout – internal setting

10.1 Setting filter

Dependly on conditions set the filter. If the conditions are conductive set the filter as very fast (value of the parameter 01 Filter 1) and if the conditions are bad (vibrations, draught) set the filter as slowly or very slowly (value of the parameter 01 Filtr at 4 or 5). Efficience of filter is different for range of weighing. The filter works slowler during getting to weighed mass. It works faster when mass is the settled filer range (parameter filter range accessed only from service menu – user does not have acess).

10.2. Mediane filter setting

Mediane filter eliminates singular big disturbances. The speed of filter can be determined after set digital value. For zero option filter function is switched off – only filter described in p. 10.1 works.

10.3 Set the display refreshing time

This parameter determines period of time which the display refreshes in. Information on the display is compared to information which is sent by the comparator processor about load on the pan.
For higher values of the refreshing parameter indirect not stable mass indications are not presented on the display during puttin on and yesing off the load. For low values all changes in mass during weighing are visible – it enables to dosage liquids and solids. The refreshing time is settled in seconds.

10.4 Set autozero working

To ensure precise indications programmable function „AUTOZERO" is in the comparator. This function controls automaticaly and corrects zero indication of the comparator.

If the function is active following results in declared periods of time are compared eg. each 1s. If these results differs at less value than declared range AUTOZERA eg. 1 interval the comparator sets to zero automaticaly and ▁◢ and →0← appears on the display.

If the AUTOZERO function is active each measurement starts at precise zero every time. In special cases this function disturbes in the measurements eg. when the load is put on the pan very slowly (pouring substance). In this case correcting system of zero indication can correct also indication of real load mass. AUTOZERA is switched on anr off in the parameter P4 03 in accordance with p. 5.1.1 of the manual.

10.5. Last digit

To ensure komfort of work with the comparator user determines (dependly on needs) if last digit should be displayed and when. One of the following values can be selected:

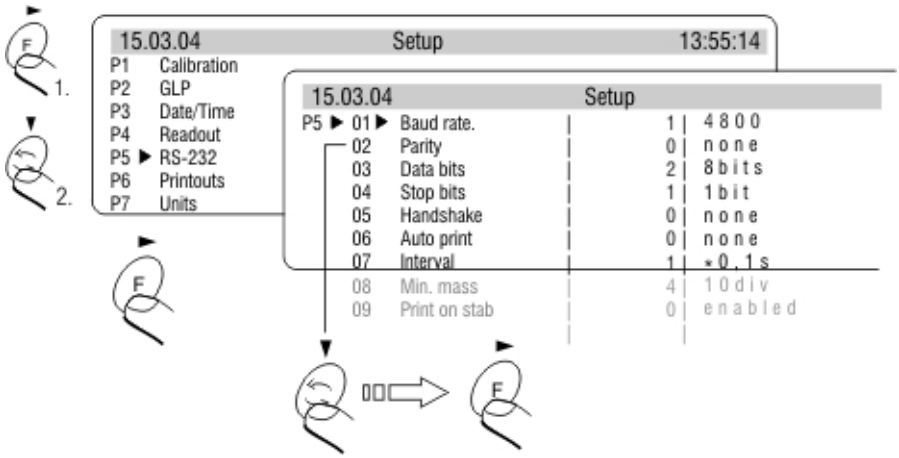
- 0 never
- 1 always
- 2 when stab

10.6. Negative

Function sets way of laying-out descriptions on the display .Function should be set depending on used display .

11. FUNCTIONS IN USING RS 232 PORT

User can set the parameters necessary for correct comunication comparator with computer or printer.



Submenu RS 232 - setting

Parameter No and name	Parameter value	Parameter No and name	Parameter value
01 Speed of transmission	0 : 2400; 1 : 4800; 2 : 9600; 3 : 19200	06 Automatic printout	0 : no; 1 : constance; 2 : with breakes; 3 : for stable.
02 Parity	0 : no; 1 : see; 2 : dont see	07 Interval	Interval it is defined how often comparator sends indications through RS 232 port. It is counted on base on form for the parameter x 0.1 s = time yestu-interval). Value from 1 to 9999 can be written.
03 Date bits	1 : 7 bits; 2 : 8 bits		
04 Stop bits	1 : 1 bit; 2 : 2 bits	08 Print stable	0 : no; 1 : yes
05 Transmission control	0 : no; 1 : RTS/CTS; 2 : XON/XOFF		

After setting correct values return to weighing mode as it is described in p. 5.1.2 of the manual.
For value 1 : computer parameter 09 Printout to, for printouts the last digit of indication is omited.

12. PRINTOUTS

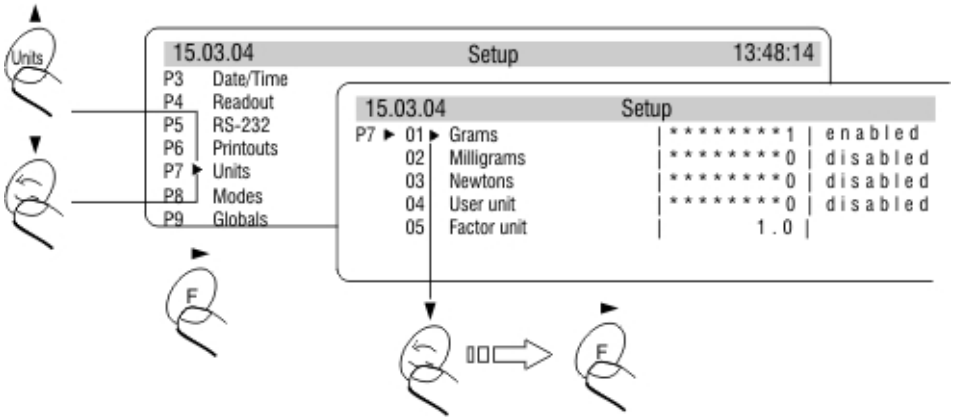
This function is used to make not standard printouts and select type of printout. Precise description for printouts is described in p.17.

13. ACCESS TO MASS UNITS

In this group of parameters user declares mass units which are accessible for operator directly under the key **Units.**

All units which value of the parameters is set up at 1: yes are accessible from the level of switching between units.

Enter group of the parameters P7 Units according to p. 5.2.7.

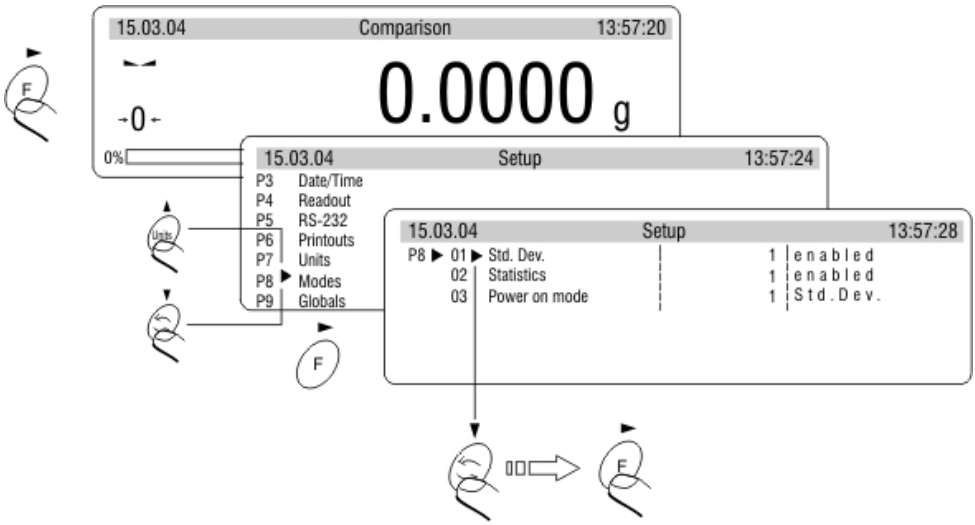


Measure units - setting

After set proper values of the parameters return to weighing mode in accordance to p 5.1.2 of the manual.

14. SETTING ACCESSIBILITY OF THE WORK MODES

In this group of parameters user declares work modes which are accessible for operator after pressing Mode key.

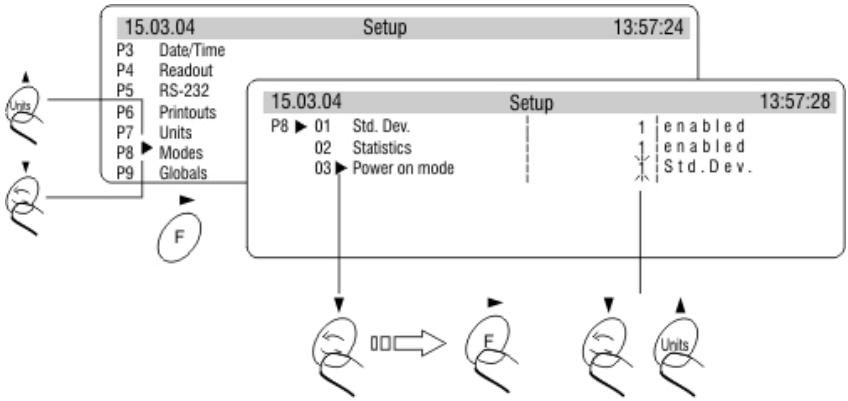


The comparator functions - setting

All work modes values of the parameters are 1: yes are accessible from the level of switching between work modes. The changes of the parameters can be done according to p. 5.1.1 of the manual.

14.1. Power on mode

Function enables to set mode in which comparator is started after turning supply on and off .



The comparator functions - setting

Values of parametr:

- 0 – Comparison
- 1 – Standard Deviation
- 2 – Statistics

After selecting appropriate value and saving the setting in memory comparator after switching on will be starting in selected working mode .

15. OTHER PARAMETERS

User can set parameters have influence on work with comparator in group of the paraemeters P9 Others eg. beep signals etc. Enter submenu group P9 Others the same as in pakt. 14.

01 ID Setting
it includes 6 digits 6 codes which can be used during printouts for product specification, operator, batch etc.

02 Aut. Printout ID
for the option YES all digit codes are printed, for option NO the codes are not printed.

03 Signal
beep signal for pressing keys

04 Language
selection of languages

05 Backlight
switch on/off the backlight

06 Contrast
changes contrast – after entering this function a window appears, by means of keys on the comparator contrast on the display can be changed

07 Screen server
if the screen server is switched on displayed values disappear after settled time and if displayed value of the measurement does not change.

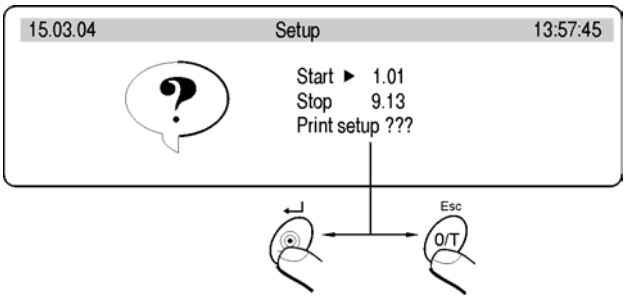
08 Temperature
it is information about temperature which is registered by temperature sensor in the comparator. Return to the menu – press the ESC key

09 The comparator number
it is only information about factory number of the comparator

10 The number of the program
it is information about program number of the comparator

11 Printout of the parameters

if the function is active the comparator parameters in user menu are printed. User gives numbers of the parameters which should be printed.



Submenu Others - printing setting

After confirmation parameters are printed through RS 232 port, actualy sent settled user parameters in the comparator

12 The parameter reception

If the functions are activated all parameters of the comparator are received through RS 232. After reception the comparator informs user how many parameters are accepted, how many are changed, how many were declared incorrectly and how many were not accepted by the software.

Printing and reception of the parameters is very easy and fast procedure of introducing new setting. After printing actual parameters to file in the computer user changes the parameters very fastly and without any problems. User sends new corrected setting to the comparator software. After these changes the comparator accepts new set up. User must know all parameters and computer operation very well.

13 Password protection

this submenu contains options about accee password for administrator and user *(see 6.1.)*

16. USING WORK MODES

16.1. Standard deviation for comparator

Function enables to determine standard deviation for comparator .

Standard deviation is determined by series of measurements ABBA or ABA where:
A – controlling standard mass
B – tested standard mass

Number of series ABBA or ABA is set by user in functions setting (from 1 to 20).

Results are calculated by software according to below tables and formulas.

For ABBA series

LP.	*A*	*B*	*B*	*A*	$r = B_{śr} - A_{śr}$
1					r_1
2					r_2
3					r_3
4					r_4
5					r_5
…..					…
n					r_n

For ABA series

LP.	*A*	*B*	*A*	$r = B - A_{śr}$
1				r_1
2				r_2
3				r_3
4				r_4
5				r_5
…..				…
n				r_n

Calculate standard deviation by determining in turns:

differences of indications ABBA or ABA for each series of measuremets:

$$r_i = \bar{B} - \bar{A}$$

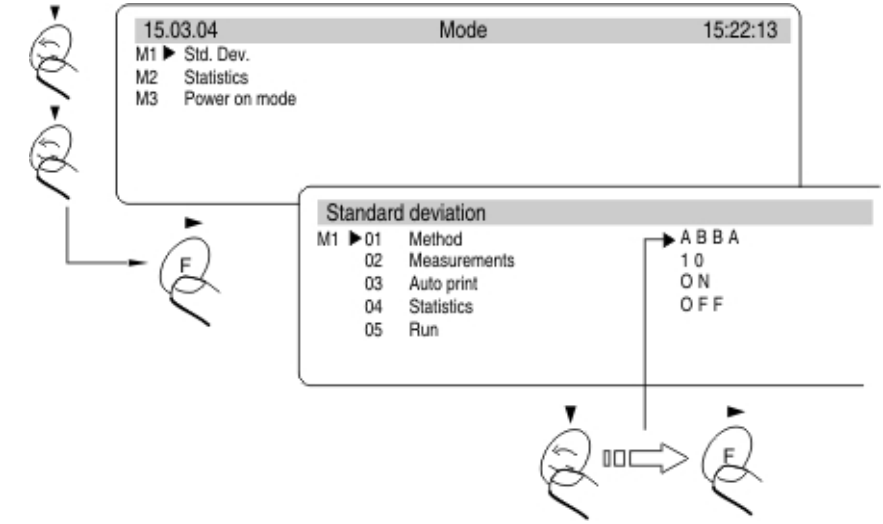
average value of indications differences ABBA or ABA- r_i

$$\bar{r}_i = \frac{1}{n}\sum_{i=1}^{n} r_i$$

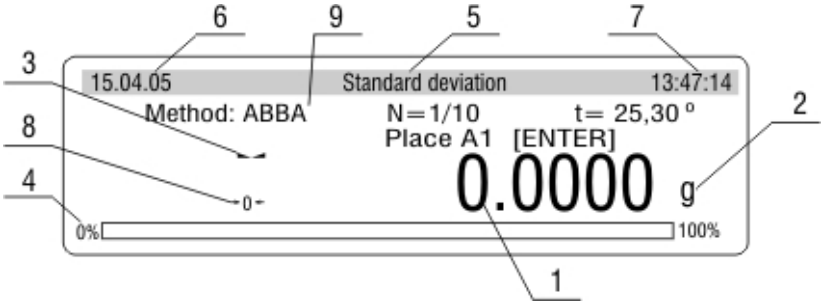
Standard deviation

$$s^2 = \frac{1}{n}\sum_{i=1}^{n} (r_i - \bar{r}_i)^2$$

Activation



The comparator functions - setting



Display

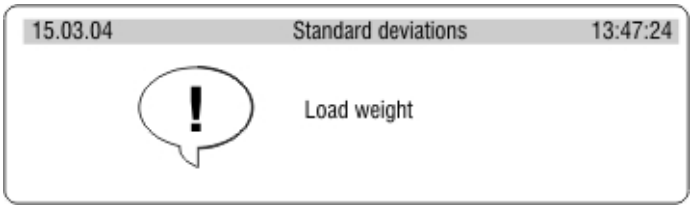
1. load mass and quantity of pieces
2. measure unit
3. the result is stable
4. line of max range of the comparator
5. work mode
6. date
7. time
8. precise ZERO
9. display concerning settings and procedure for selected working mode

Before starting the procedure select:

- method of determining deviation - ABBA or ABA,
- declare number of tests for measurements series – *n*

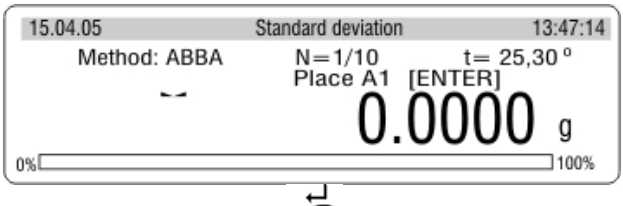
„description concerns ABBA method"

After setting the option enter the procedure . The display will show:



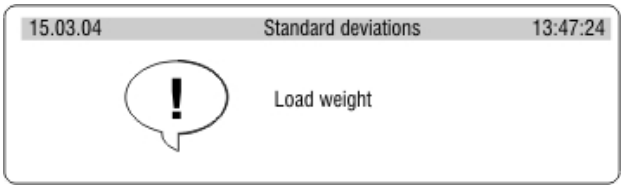
Display

Place calibration mass on the pan „A”

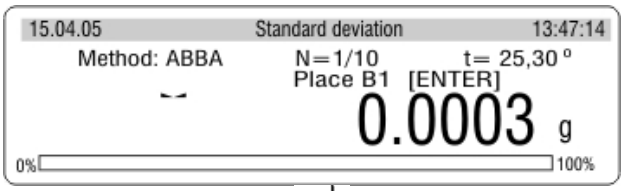


when marker ⌙ appears press key . Descriptions on the display concerning weighed calibration mass B1 will change.

Remove calibration mass „A”, display will show:

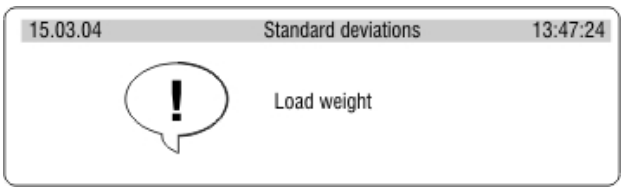


Place on the pan calibration mass „B”

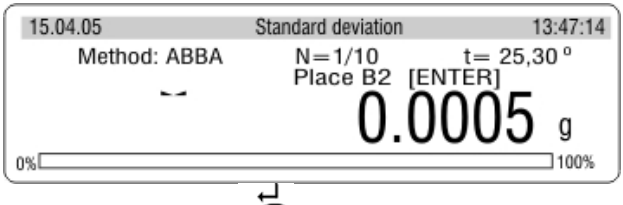


when marker ⌙ appears press key. Description on the display concerning calibration mass B2 will change.

Remove calibration mass „B”, display will show:

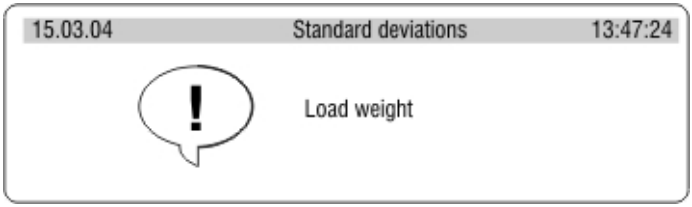


Place again on the pan calibration mass „B”

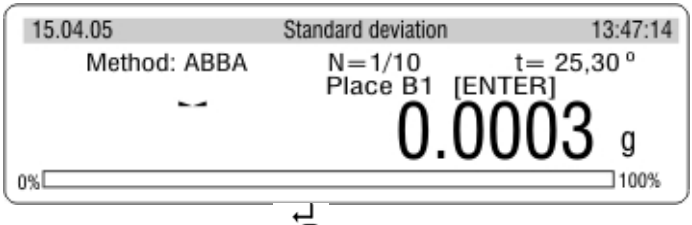


when marker appears press key . Description on the display concerning calibration mass A2 will change.

Remove calibration mass „B”, the display will show:



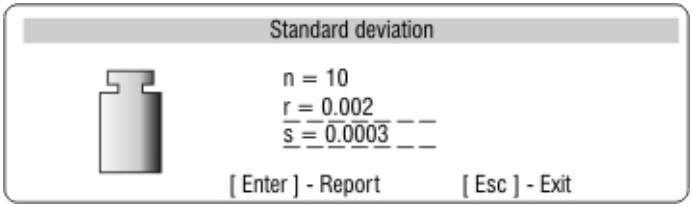
Place on the pan calibration mass „A”



when marker appears press key .

Description on the display concerning weighted calibration mass A2 and number of measurements in series N=2/10 will change.

Repeat measurements for in quantity of series declared in function settings. After approval of last measurement in series , software will display summary.



From level of this window it is possible to print final report including particular measurements and final data.

Look of exemplary report:

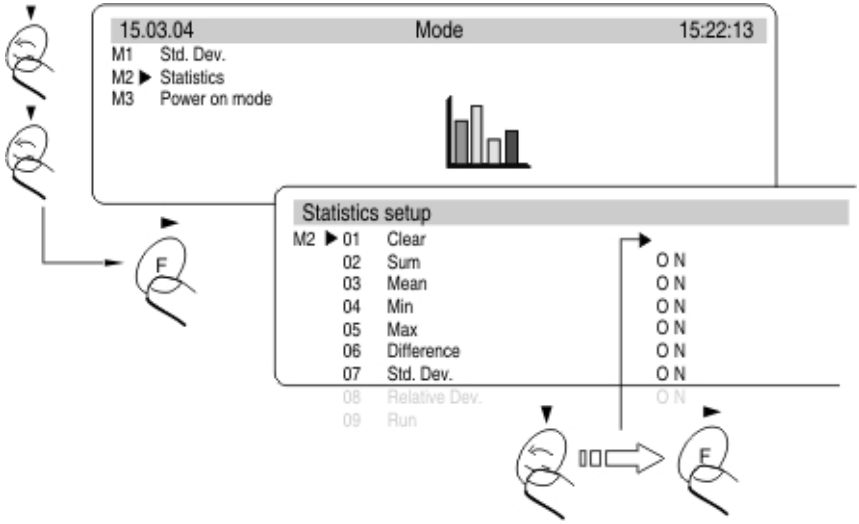
n	:A	:B	:B	:A	:r
1	:-0.0008	:-0.0032	:-0.0038	:-0.0005	:-0.0029
2	:-0.0002	:-0.0037	:-0.0035	:-0.0001	:-0.0035
3	: 0.0001	:-0.0035	:-0.0034	: 0.0000	:-0.0035
4	: 0.0003	:-0.0033	:-0.0032	: 0.0004	:-0.0036
5	:-0.0002	:-0.0033	:-0.0032	:-0.0001	:-0.0031
6	: 0.0000	:-0.0035	:-0.0036	: 0.0001	:-0.0036
7	: 0.0001	:-0.0038	:-0.0037	: 0.0005	:-0.0041
8	:-0.0004	:-0.0033	:-0.0034	:-0.0002	:-0.0031
9	:-0.0002	:-0.0033	:-0.0035	:-0.0004	:-0.0031
10	: 0.0003	:-0.0034	:-0.0035	: 0.0003	:-0.0038

n = 10
r = -0.0034
s = 0.00035

Report

16.2. Statistics

Activation



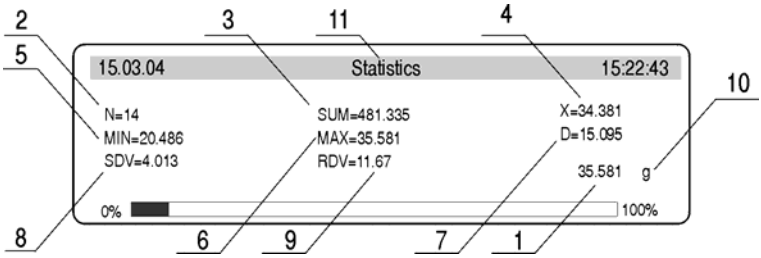
Statistics – fucntion activation

Results of previous statistics should removed after function activation. It is realized through option **M2 01 Clear.**

All statistic date are actualized after write following measurement to the comparator memory. Following measurment is writen to series after load is put on the pan, stabilization of the result (measure unit is displayed) and after pressing **ENTER.**

User decides what statistic date are presented on the graphic display during measurements by setting their activity in the submenu of work mode (values which are set for YES are active). Independly on setting (YES/ NO), during final result (the key UNITS) the printout contains full statistics.

N :	*5*	*(quantity of weights)*
SUM :	*161.121 g*	*(all components total mass)*
X :	*32.224 g*	*(average mass of weighed components)*
MIN :	*20.486 g*	*(min mass)*
MAX :	*35.578 g*	*(max mass)*
D :	*15.092 g*	*(difference between Max- Min)*
SDV :	*6.581 g*	*(standard deviation)*
RDV :	*20.4 %*	*(variation factor)*



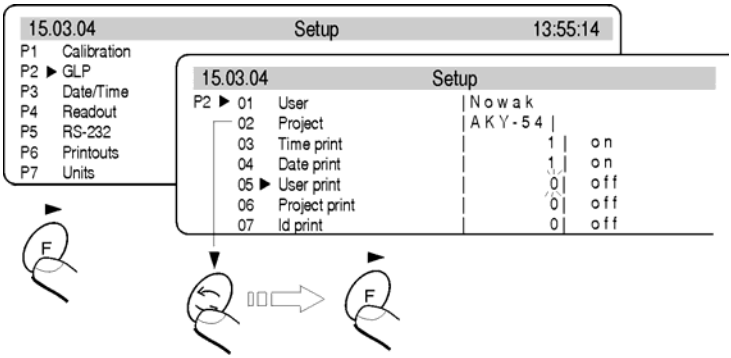
Statistics – display for series of measurement

1. mass on the pan
2. measurement number in measurement series
3. sum of all weighed components in measurement series
4. average mass of weighed components in the series
5. mass of the lightest component in measurement series
6. mas sof the heaviest component in measurement series
7. difference between the lightest and the heaviest component in measurement series
8. value of counted standard deviation
9. value of variation factor
10. measure unit [g]
11. work mode

17. KINDS OF PRINTOUTS

17.1. Standard printout

The are 2 types of printouts. First of them is standard printout. It includes result of weighing and all variables which have attibute YES in GLP submenu. In User and Project fields names should be written.



Declaration of variables to printout – submenu GLP

```
Date     : 13/09/2004
Time     : 16:30:50
User Id  : Nowak
Project Id   : tabletka
Balance Id   : 117436
Last calibration:
----------------------
09/09/2004      12:23
automatic calibration
Diff.:      0.001 g
----------------------
    13.829 g
```

Example of standard printout (all option settled on YES – printed)

```
Date        : 13/09/2004
User Id     : Nowak
Project Id  : tabletka
Balance Id      : 117436
    13.838 g
```

Example of standard printout

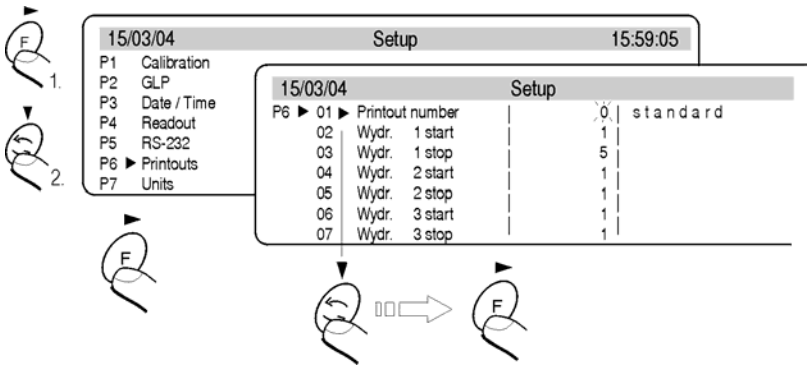
Question mark before load mass means that the result is not stable.

17.2. Non-standard printout

Procedure of creating non-standard printouts:

- user can create own 4 printouts,
- give the number of the text which starts the printout eg. Printout 1 Start – 1 and text number which finishes the printout eg. Printout 1 Stop – 40. In this case texts from 1 to 40 are printed.
- And then write text in the lines 1 ÷ 40.
  It is recomended to use PC keyboard what is simplier and faster way.
- Non-standard printouts can overlap each other:
  Printout 1 Start – 1
  Printout 1 Stop – 40
  Printout 2 Start – 20
  Printout 2 Stop – 40
- **Non-standard printout can be created by Edition of the printout.**

*During manual writting give all special signs as CRLF, tabulator etc. If function Printout Edition is used all these values can be selected in form of ready elements. They are transmitted from one side **Line of selection** to the other window **Printout***



Menu pritnouts – the function activation

Non-standard printout can include:

- Variable dependly on work mode and other user necessities (mass, date, Project No)
- Stable texts in user menu
- Non-standard printout can include not more than 640 signs recorded as 80 texts 8 signs each (from the parameter Text 1 to Text 80). User can design 4 non-standard printouts

17.2.1 Texts
Variables in all modes and with the same values

%%	Printout of „%” singular sign
%N	Actual net mass in basic unit
%d	Actual date
%t	Actual time
%i	The comparator number
%R	The program number
%P	The Project number
%U	The user number
%F	Actual function name – work mode
%C	Date and time of last calibration
%K	Kind of last calibration
%I	Deviation of last calibration
%1	Code 1
%2	Code 2
%3	Code 3
%4	Code 4
%5	Code 5
%6	Code 6

Statistic variables in all modes apart from basic weighing

%n	The measurement number
%x	Average value
%S	Sum
%m	Min value
%M	Max value
%D	Difference between max and min value
%s	Standard deviation
%r	Variation factor

Variable in all modes which value depends on the mode

%V – Mass in actual unit. Value connected to work mode eg. counting pieces for mode Counting pieces or deviation from standard mass in % for mode Deviation

Special signs used to create special printouts

\\	Singular sign „\"
\c	CRLF
\r	CR
\n	LF
\t	Tabulator
\s	skip to next „string"
\0	End of the printout

Each text (Text 1 ÷ 89 Text 80) can include max 8 signs (letters, digits, special signs, spaces). To write long sentence create it using 8 sings texts. User can use special signs to include variables dependly on own necessities.

Example 1:
Max mass cannot be higher than 11.250 g!

If user write this sentence uses 640 signs grouped in adjacent lines of the text. Set up following texts and write 8 signs in each of them untill the sentence finishes.

Parameter number	**Text**							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
19 Text 10	M	a	s	a		m	a	k
20 Text 11	s	y	m	a	l	n	a	
21 Text 12	n	i	e		m	o	ż	e
22 Text 13	p	r	z	e	k	r	a	c
23 Text 14	z	a	ć		1	1	.	2
24 Text 15	5	5	0		g	!		

Example 2:
Zakład Mechaniki Precyzyjnej „RADWAG”
Date:
Time:
Load mass:
*****Signature:.....
<actual work mode>

Set following texts and write 8 signs in each of them untill it is finished.

Parameter number	Text							
	1	2	3	4	5	6	7	8
25 Text 16	Z	a	k	ł	a	d		M
26 Text 17	e	c	h	a	n	i	k	i
27 Text 18		P	r	e	c	y	z	y
28 Text 19	j	n	e	j		„	R	A
29 Text 20	D	W	A	G	„	\	c	D
30 Text 21	a	t	a	:	%	d	\	c
31 Text 22	G	o	d	z	i	n	a	:
32 Text 23	%	t	\	r	\	n	M	a
33 Text 24	s	a		ł	a	d	u	n
34 Text 25	k	u	:	%	N	\	c	\
35 Text 26	c	*	*	*	*	*	P	o
36 Text 27	d	p	i	s	:	.	.	.
37 Text 28	.	.	.	.	.	.	.	\
38 Text 29	c	*	*	*	%	F	*	*
39 Text 30	*							

– **On the comparator desk**

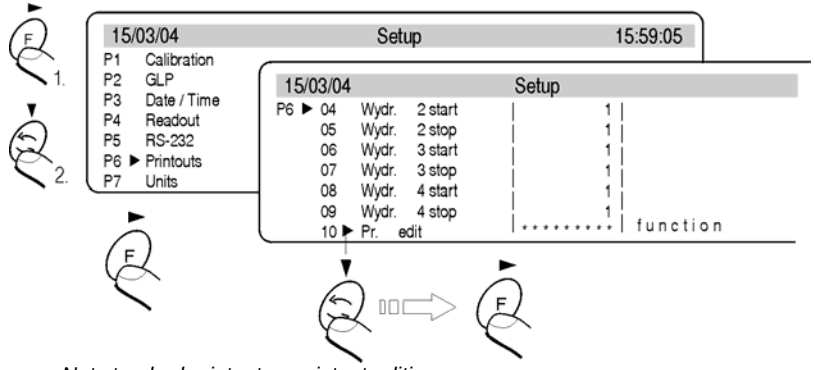
	Move up through digits, letters and sings o 1
	Move down through digits, letters and sings o 1
	Determine sign to change and move right (if the key is pressed flashing sign is moved in right direction. If no sign is written this keys makes space in the text)
	Determine sign to change and move lef (after this key is pressed flashing sign is cancelled)
	Confirm the text

– **On PS/2 keyboard**

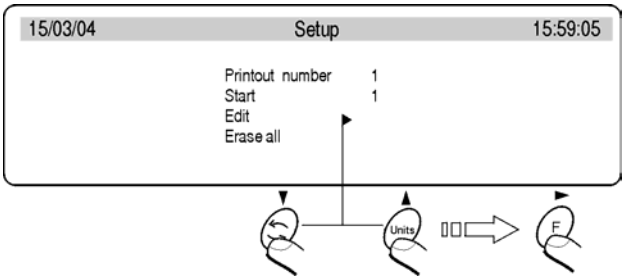
Press F2 to enter main menu. Press F3 to set parameters indications next to group P6 Printouts and press F2 to enter menu group and then select parameter. Press F2 to activate the procedure of writing the text. By means of keyboard write the text (max 8 signs) and confirm by Enter. Repeat this procedure for the rest of the texts. Description of the computer keyboard is in the p. 5.1.3

17.2.2. Composing texts by Edition function

The function activation

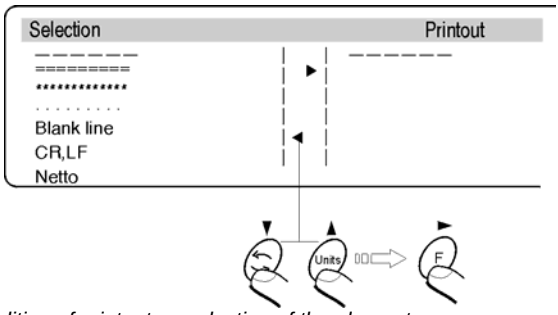


Not standard printouts – printout edition



Not standard printouts – printout edition – select

After activation of the function select printout number (1-4) and beginning of writting the texts in (range from text 1 to text 80). Then select the option Edition to edite (create) printout or cancell all (remove all printouts).



Edition of printouts – selection of the elements

To select following fields use keys **Units** and **Mode**. To print field press the F key. After the edition press ENTER/PRINT. Display shows question if printout should be done – press ENTER/PRINT again.

17.2.3 select non-standard printouts

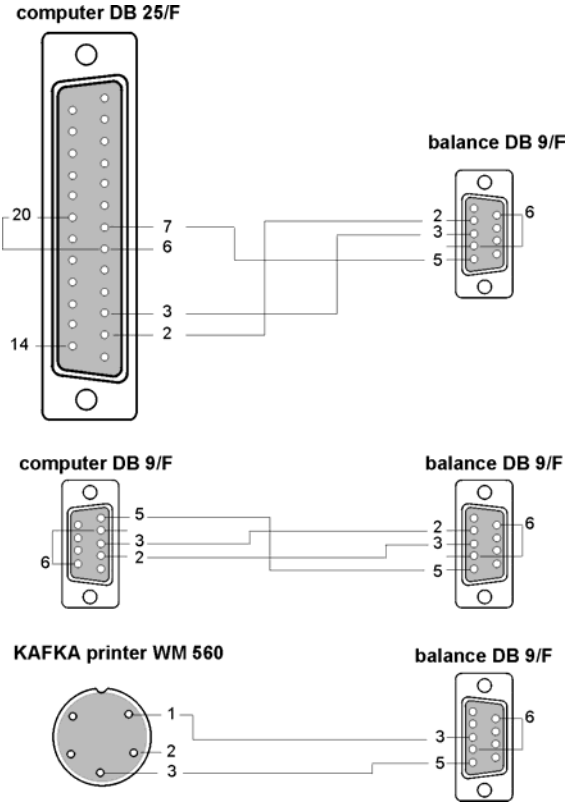
if STANDARD printout is selected – there will be only result and variables declared in the GLP *(see p. 17.1 Standard printout. Declaration of the variables to printout – submenu GLP).*

If non-standard printout is printed select kind of the printout (1-4) and give the beginning and end of the printout.

18. COOPERATION WITH PRINTER OR COMPUTER

To send the information on the display with the unit of measure to the computer or printer, press the < **PRINT** > key. 9600 bit/s is the default setting for the speed of transmission. If the peripheral unit has a different speed of transmission, you may change the speed of transmission in the comparator menu. (see p. 15 of the manual)

18.1. Connections



Connections comparator - computer

The comparator connection DB 9/F – The computer connection DB 9/F (with control of sending date)

Comparator	Computer
2 (RxD)	3 (TxD)
3 (TxD)	2 (RxD)
4 (DTR)	6 DSR
5 (GND)	5 (GND)
6 (DSR)	6 (DTR)
7 (RTS)	8 (CTS)
8 (CTS)	7 (RTS)

19. LIST OF COMMUNICATIONS COMPUTER - COMPARATOR

Function RESET INTERFACE
Command R CR LF (zero actual orders, restore factory setting)

Function SEND ALL COMMANDS FROM THE COMPARATOR
Command PC CR LF (all recorded information in commands in the comparator programme are sent from the comparator)

Function SEND THE RESULT IN BASIC UNIT
Command S CR LF (result is sent from the comparator in basic interval after stability)

Function SEND RESULT IN BASIC UNIT IMMEDIATELY
Command SI CR LF

Function ZERO THE COMPARATOR
Command Z CR LF (set the comparator to zero after it reaches stability)

Function TARE WHEN STABLE
Command T CR LF

Function SWITCH CONSTANCE TRANSMISSION OFF IN BASIC INTERVAL
Command C0 CR LF

Function SWITCH CONSTANCE TRANSMISSION IN BASIC INTERVAL
Command C1 CR LF

Function NUMBER OF THE COMPARATOR
Command NB CR LF

Function PROGRAM VERSION
Command RV CR LF

Function SEND SETUP
Command PS CR LF (all comparator setup is sent – printout of the parameters)

Function SOUND SIGNAL – „BEEP“
Command B CR LF (sound beep is switched on)

Function SEND LAST ERROR CODE
Command ER CR LF (last order of the error is sent)

Function BLOCK THE KEYBOARD
Command KL CR LF

Function UNBLOCK THE KEYBOARD
Command KU CR LF

Function SWITCH „ECHO“ OFF FOR THE KEYBOARD
Command E0 CR LF (keys codes are switched off)

Function SWITCH „ECHO“ ON FOR THE KEYBOARD
Command E1 CR LF

Function SWITCH THE COMPARATOR OFF
Command O0 CR LF (the same as ON/OFF)

Function SWITCH THE COMPARATOR ON
Command O1 CR LF (the same as ON/OFF)

Function SWITCH AUTOZERO OFF
Command A0 CR LF

Function SWITCH AUTOZERO ON
Command A1 CR LF

If command which is not listed or with error and with CRLF at the end the command is returned in E S CR LF form. Spaces in the forms should be omited ,

20. TECHNICAL PARAMETERS

	WAX 210/KO
capacity	210 g
reading unit	0,01 mg
range of electric compensation	0....20 g
calibration	External (10g)
repeatability	0,0,1 mg
stabilization time	2....10 s
temperature error (drift)	± 1,5 ppm/°C
recommended range of applications according to OIML R111	50g; 100g; 200g
pan dimension	Ø 40 mm
height of free space above the pan	-
max temperature change (°C/24h)	0,5
relative humidity of air (%)	40....70
dimensions (WxLxH) mm	220 x 540 x 420
power supply	230V 50Hz / 11V AC
operating temperature range	18 - 30 °C

	WAX 510/KO
capacity	510 g
reading unit	0,1 mg
range of electric compensation	0....10 g
calibration	External (10g)
repeatability	0,1 mg
stabilization time	2....10 s
temperature error (drift)	± 1,5 ppm/°C
recommended range of applications according to OIML R111	100g; 200g; 500g
pan dimension	Ø 50 mm
height of free space above the pan	-
max temperature change (°C/24h)	0,5
relative humidity of air (%)	40....70
dimensions (WxLxH) mm	220 x 540 x 420
power supply	230V 50Hz / 11V AC
operating temperature range	18 - 30 °C

	WAX 2100/KO
capacity	2100 g
reading unit	0,1 mg
range of electric compensation	0....210 g
calibration	External (100g)
repeatability	0,3 mg
stabilization time	2....10 s
temperature error (drift)	± 1,5 ppm/°C
recommended range of applications according to OIML R111	500g; 1kg; 2kg
pan dimension	Ø 80 mm
height of free space above the pan	-
max temperature change (°C/24h)	0,5
relative humidity of air (%)	40....70
dimensions (WxLxH) mm	220 x 540 x 420
power supply	230V 50Hz / 11V AC
operating temperature range	18 - 30 °C

	WAX 5100/KO
capacity	5100 g
reading unit	1 mg
range of electric compensation	0....110 g
calibration	External (100g)
repeatability	0,3 mg
stabilization time	2....10 s
temperature error (drift)	± 1,5 ppm/°C
recommended range of applications according to OIML R111	1kg; 2kg; 5kg
pan dimension	Ø 120 mm
height of free space above the pan	-
max temperature change (°C/24h)	0,5
relative humidity of air (%)	40....70
dimensions (WxLxH) mm	220 x 540 x 420
power supply	230V 50Hz / 11V AC
operating temperature range	18 - 30 °C

21. COMMANDS ABOUT ERRORS

Order	Error number	Error description
"control sum error"	**1.1**	Errors duting date transmission
"A/D Error"	**1.2**	Converter error
"Exceed range"	**2.1**	Exceed max measure range of the comparator
" Exceed range "	**2.2**	Exceed max measure range of the comparator
"A/D Null"	**2.3**	No divisions from converter
"A/D Full"	**2.4**	Exceed max value converter intervals
"Tara/Zero above the range"	**2.5**	Exceed admissible tare or zero value
"Tara above the range "	**2.6**	Exceed admissible tare value for the comparators
"Zero above the range"	**2.7**	Exceed zero range for the comparators
"Result > 4% Max"	**2.8**	To high start mass (start the comparator up with load on the pan)
"Result > 1% Max"	**2.9**	Difference between determined calibration mass and calibration mass recorded in the comparator memory higher than (difference >1%)
"Piece < 1 Div"	**2.10**	Singular mass value in counting pieces function less than actual scale interval
Piece < 10 Div"	**2.11**	Mass on the pan during determining mas sof singular piece in the function of counting pieces less than 10 actual scale intervals
"above the range"	**3.1**	The parameter value above the range
"Faulty value"	**3.2**	Inadmissible value of the paraemter
"Blocked - DRH"	**3.3**	The parameter cannot be changed (Function **DRH** active in the factory menu)

"Writting error "	**4.1**	Errors during date transmission to sprinter or computer
" Party error"	**4.2**	
" Frame error"	**4.3**	
"stopped transmission CTS"	**4.4**	
" stopped transmission XOFF"	**4.5**	
"incorrect date"	**5.1**	Faulty date
"Exceed time"	**6.1**	Exceed admissible time during for an operation (eg. zero)

MANUFACTURER
OF ELECTRONIC WEIGHING INSTRUMENTS

RADWAG 26 – 600 Radom
Bracka 28 Street
POLAND

Central tel. +48 48 38 48 800, tel./fax. + 48 48 385 00 10
Sales Department + 48 48 366 80 06
www.radwag.com

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